What is claimed is:

- 1 1\An interleaving method comprising the steps of:
- 2 \ arranging data to be transmitted in a matrix;
- 3 and
- 4 \quad randomly rearranging at least either columns
- 5 or rows of said data and outputting said rearranged
- 6 data in time series.
- 1 2. A de-interleaving method comprising the steps of:
- 2 arkanging received data having been
- 3 interleaved\in a matrix; and
- 4 randomly rearranging at least either columns
- 5 or rows of said data, and outputting said data in time
- 6 series, thereby\outputting said received data in the
- 7 order before said received data was interleaved.
- 1 3. An interleaving apparatus for interleaving data
- 2 to be transmitted,\comprising:
- a first storing unit for storing data to be
- 4 transmitted; and
- a first control unit for controlling said
- 6 first storing unit so that said data to be transmitted
- 7 is outputted from said first storing unit with said
- 8 data to be transmitted arranged in a matrix and at
- 9 least either columns or hows of said data to be
- 10 transmitted randomly rearranged.

11

4. The interleaving apparatus according to claim 3, 1 wherein said first control unit comprises a first 2 write controlling unit for generating a write address 3 to be used to write said data to be transmitted in said 4 first storing unit with said data to be transmitted 5 arranged in a matrix and at least either columns or 6 said data to be transmitted randomly οf rows 7 rearranged and for writing said data to be transmitted 8 in said first storing unit, and said first control unit 9 reads said data to be transmitted stored in said first 10 storing uni $oldsymbol{t}$ in the order of addresses.

- 5. The interleaving apparatus according to claim 4, 1 wherein said first write control unit comprises a
- column number generating unit for randomly generating 3
- column numbers and a row number generating unit for 4
- randomly generating row numbers, and said first 5
- write control unit writes said data to be transmitted 6
- in said first storing unit with numbers generated by 7
- said column number generating unit and said row number 8
- generating unit as said write address to write said 9
- data to be transmitted in said first storing unit. 10
 - 6. The interleaving apparatus according to claim 5, 1
 - wherein each of said column number generating unit and
 - said row number generating\unit is configured with a

- 4 memory for holding numbers used as addresses in a
- 5 predetermined order.
- 1 7. The interleaving apparatus according to claim 3,
- 2 wherein said first control unit writes said data to
- 3 be transmitted in said first storing unit in the order
- 4 of addresse's, and said first control unit comprises
- 5 a first read\controlling unit for generating a read
- 6 address to be used to read said data to be transmitted
- 7 from said first storing unit with said data to be
- 8 transmitted stored in said first storing unit arranged
- 9 in a matrix and at least either columns or rows of said
- 10 data to be transmitted randomly rearranged to read
- 11 said data to be transmitted.
- 1 8. The interleaving apparatus according to claim 7,
- 2 wherein said first read control unit comprises a
- 3 column number generating unit for randomly generating
- 4 column numbers and a row number generating unit for
- 5 randomly generating row numbers, and said first read
- 6 control unit reads said data to be transmitted from
- 7 said first storing unit with\numbers generated by said
- 8 column number generating unit and said row number
- 9 generating unit as said read\ address.
- 1 9. The interleaving apparatus according to claim 8,
- 2 wherein each of said column number generating unit and

- 3 said row number generating unit is configured with a
- 4 memory for holding numbers used as addresses in a
- 5 predetermined order.
- 1 10. A definterleaving apparatus for de-interleaving
- 2 received \data, comprising:
- 3 a\second storing unit for storing said
- 4 received data; and
- a second control unit for controlling said
- 6 second storing unit so that said received data is
- 7 outputted from said second storing unit in a state
- 8 before said received data was interleaved by arranging
- 9 said received\ data in a matrix and randomly
- 10 rearranging at least either columns or rows of said
- 11 received data.
- 1 11. The de-intexleaving apparatus according to
- 2 claim 10, wherein said second control unit comprises
- 3 a second write control unit for generating a write
- 4 address to be used to write said received data in said
- 5 second storing unit in a state before said received
- 6 data was interleaved by arranging said received data
- 7 in a matrix and randomly rearranging at least either
- 8 columns or rows of said received data to write said
- 9 received data, and said $\sec \Delta nd$ control unit reads said
- 10 received data stored in said second storing unit in
- 11 the order of addresses.

9

12. The de-interleaving apparatus according to claim 1 11, wherein\said second write control unit comprises 2 number generating unit for randomly column 3 generating column numbers and a row number generating 4 unit for randomly generating row numbers, and said 5 second write dontrol unit writes said data in said 6 second storing \backslash unit with numbers generated by said 7 column number generating unit and said row number 8 generating unit \as a write address.

13. The de-interleaving apparatus according to claim 1 12, wherein each of\said column number generating unit 2 and said row number generating unit is configured with 3 a memory for holding numbers used as addresses in a 4 predetermined order. 5

14. The de-interleavi \mathbf{h} g apparatus according to claim 1 10, wherein said second control unit writes said 2 received data in said second storing unit in the order 3 of addresses, and said sedond control unit has a second 4 read controlling unit for γ generating a read address 5 to be used to read said received data in a state before 6 said received data was interleaved from said second 7 storing unit by arranging said received data stored in said second storing unit i h a matrix and randomly 9 rearranging at least either columns or rows of said 10

11 received data and for reading said received data from

12 said second storing unit.

1 15. The de-interleaving apparatus according to claim

2 14, wherein said second read control unit comprises

3 a column humber generating unit for randomly

4 generating column numbers and a row number generating

5 unit for randomly generating row numbers, and said

6 second read control unit reads said received data from

7 said second storing unit with numbers generated by

8 said column number generating unit and said row number

9 generating unit \setminus as a read address.

1 16. The de-interleaving apparatus according to claim

2 15, wherein each of said column number generating unit

3 and said row number generating unit is configured with

4 a memory for holding\numbers used as addresses in a

5 predetermined order.

1 17. An interleaving/de-interleaving system

2 comprising an interleaving apparatus for

3 interleaving data to be transmitted and a de-

4 interleaving apparatusigg
angle for receiving said

5 transmitted data interleaved by said interleaving

6 apparatus to de-interleave said transmitted data,

7 wherein said interleaving apparatus outputs said data

8 to be transmitted with said data to be transmitted

9 arranged in a matrix and at least either columns or

10 rows of said data to be transmitted randomly

11 rearranged, and said de-interleaving apparatus

12 outputs received data in a state before said

13 transmitted data was interleaved by arranging said

14 received data\in a matrix and randomly rearranging at

15 least either columns or rows of said received data.

1 18. An interleaving/de-interleaving apparatus for

2 transmitting/redeiving interleaved data to/from an

3 opposite interleaving/de-interleaving apparatus,

4 comprising:

5 an interleaving apparatus for outputting data

6 to be transmitted to said opposite

7 interleaving/de-interleaving apparatus with said

8 data to be transmitted arranged in a matrix, and at

9 least either columns or rows of said data to be

10 transmitted randomly rearranged; and

a de-interleaving apparatus for outputting

12 received data interleaved in said opposite

13 interleaving/de-interleaving apparatus in a state

14 before said received data was interleaved by arranging

15 said received data in a matrix, and randomly

16 rearranging at least either columns or rows of said

17 received data.

0